Uca, while Homarus remains ; in the mollusk the latest vagaries of the systematist are introduced, while in the worms a more conservative course has been adopted. Here and there errors occur. Thus the nemertines are regarded as a class of Plathelminthes, and (p. 164) the flatworms are stated to lack an anus. Under the Gephyræa, *Sipunculus nudus* is included as an American form, while Echiurus and Thalassema are ignored. Yet these are minor blemishes, and the work will prove most useful not only to the casual visitor to the shore but to the more experienced naturalist as well. K.

PHYSIOLOGY.

Reactions of Hydra to an Electric Current. — Pearl [1] has observed that *Hydra viridis*, when attached by the foot and placed in the path of a constant current of weak intensity, brings the long axis of the body in line with the current, the oral end being toward the anode. This orientation is accomplished by a contraction on the anode side of the body. When the animal is not attached by the foot, the anode side still remains the side of contraction, even though the oral end may be turned toward the cathode. In addition to orientation, the current may call forth general contractions. Separate pieces of the hydra react in much the same way as whole animals. Buds and parent animals are independent in their reactions, the buds showing essentially the same reactions as adults. P.

Evolution of Pigment. — The interest which biologists have shown in the chemical activities of protoplasm has evinced itself in the study of pigment as a protoplasmic product. Bohn's [2] contribution to this subject is a timely *résumé* of some of the more important recent results. The pigments are classified as hydrocarbons, derivatives of chromatin, and derivatives of the aromatic series. The vegetable pigments are described under the heads of chromogenic bacteria and chloroleucites. The occurrence, migration, and transformation of animal pigments occupies much of the volume. The author believes that in a given cell there may be a struggle between

[1] Pearl, R. The Reactions of Hydra to the Constant Current, *Amer. Journ. Physiol.*, vol. v (1901), pp. 301–320.

[2] Bohn, G. *L'Évolution du Pigment.* Paris, Carré et Naud, 1901. 96 pp.

the various classes of pigment granules, resulting in a selection of the more favored kind. In consequence of this a harmony of color would prevail, first locally and finally throughout the organism.

P.

Excretion in Annelids. — The elimination of waste products from the bodies of annelids, particularly earthworms, has been fully studied by Willem and Minne.[1] In Lumbricus reserve products in the form of fat and of glycogen occur, the former in the ciliated cells of the intestinal epithelium, the latter in the peritoneal cells. True waste products are found in the same animal as guanine in the chloragogic cells and nephridial tubules, as uric acid in the peritoneal cells and similar elements found between the fibres of the body musculature, and as cholesterine probably in all tissues. The chloragogic cells produce guanine with more or less regularity. This is periodically discharged from these cells into the cœlomic fluid, where in common with other particles it is engulfed by the free cœlomic cells. The cœlomic cells when charged with the products of excretion make their way through the intestinal epithelium and are finally discharged into the digestive cavity The nephridial walls excrete soluble materials exclusively. Only a small amount of cœlomic fluid passes through the nephridial canal. This fluid is kept in motion by the cilia of the canal and the waste products are thus discharged.

Similar studies were made on Nereis, Nephelis, and Clepsine, and the following general conclusion drawn. In all the annelids studied the cells that line those parts of the cœlom particularly connected with the circulatory system are of service in purifying the blood. They accumulate in their protoplasm various excretory products, in some annelids one, in others another. Thus far the following substances have been identified : uric acid, guanine, sodic urate, and a substance like chitine. Many annelids show a tendency toward the obliteration of the nephrostomes, and this is accompanied by a change in the way in which the solid excreta are discharged. Cast out freely in those worms with large nephridial funnels, these products in worms with restricted nephridia are accumulated and disintegrated in the phagocytic organs and thus prepared for discharge.

P.

[1] Willem, V., et Minne, A. Recherches sur l'Excrétion chez quelques Annélides, *Mém. l'Acad. roy. de Belgique*, tome lviii (1900), pp. 1–73, Pls. I–IV.